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PROBLEMS FOR SOLUTION.

ALGEBRA.

253. Proposed by R. D. CARMICHAEL, Hartselle, Ala.

Prove that $x^5 + ax + b = 0$ is solvable by radicals if $b = ma$, m being the negative of half the sum of any two roots of the original equation. Exhibit the solution.

254. Proposed by R. D. CARMICHAEL, Hartselle, Ala.

Sum to infinity the series $\frac{n^2}{(16n^2 - 1)^2}$ beginning with $n = 1$.

255. Proposed by O. E. GLENN, Ph. D., Springfield, Mo.

Let f be the binary cubic $a_0x_1^3 + 3a_1x_1^2x_2 + 3a_2x_1x_1^2 + a_3x_2^3$, $\Delta = (f, f)_2$ the covariant, the second transvectant of f over itself, and $R = 2[4(a_0a_2 - a_1^2) \times (a_1a_3 - a_2^2) - (a_0a_3 - a_1a_2)^2] = (\Delta, \Delta)_2$ the second transvectant of Δ over itself. Then if $\Delta_{\kappa\lambda}$ is the Δ covariant for the cubic pencil $\kappa f + \lambda Q$, Q being the first transvectant of f over Δ we have $\Delta_{\kappa\lambda} = (\kappa^2 - \frac{1}{2}\lambda^2 R) \Delta$.

CALCULUS.

900. Proposed by PROFESSOR B. F. FINKEL, A. M., 4038 Locust Street, Philadelphia, Pa.

Prove that, if the differential equation $cydx - (y + a + bx)dy - nx(xdy - ydx) = 0$, be transformed into an equation between u and x by the substitution $u(y + a + bx + nx^2) = y(c + nx)$, then the variables are separable; and reduce the equation to the form $dv/\phi(v) = dx/\phi(x)$ by the further substitution $v = au + \beta$, a and β being suitably determined. *Euler*. [Forsyth's *Differential Equations*, p. 48, Ex. 4.]

DIOPHANTINE ANALYSIS.

132. Proposed by O. E. GLENN, Ph. D., Springfield, Mo.

Disregarding the order of λ, μ, ν , how many sets of solutions has the congruence $\lambda + \mu + \nu \equiv 0 \pmod{p-1}$ (p prime)?

GEOMETRY.

280. Proposed by WILLIAM HOOVER, Ph. D., Athens, Ohio.

On any diameter of a given ellipse is taken a point such that the tangents from it intercept on the tangent at one end of the diameter a length equal to the diameter; the ellipse being $a^2y^2 + b^2x^2 - a^2b^2 = 0$. Prove that the locus of the point is $\left(\frac{x^2}{a^2} - \frac{y^2}{b^2}\right)^2 = \left(\frac{a^2 + b^2}{a^2 - b^2}\right)^2 \left(\frac{x^2}{a^2} + \frac{y^2}{b^2}\right)$.

281. Proposed by G. W. GREENWOOD, M. A., McKendree College, Lebanon, Ill.

In the proposition in solid geometry "If a line is perpendicular to each of two intersecting lines it is perpendicular to the plane of the lines," it is assumed that two intersecting lines have a common perpendicular. Prove it.

282. Proposed by REV. ALAN S. HAWKESWORTH, Allegheny, Pa.

The pedal lines of any two points on the circumcircle of a triangle concur in an angle equal to that subtended by the said points.

283. Proposed by REV. ALAN S. HAWKESWORTH, Allegheny, Pa.

The right angled intersection of the pedal lines of any diameter of the circumcircle lies on the "nine points circle" of the inscribed triangle.

MECHANICS.

990. Proposed by R. D. CARMICHAEL, Hartselle, Ala.

A curve in a vertical plane has a horizontal tangent along which a heavy particle moves without friction with uniform velocity v until it reaches T , the point of tangency, when by its own momentum alone it ascends the curve against the force of gravity. Find the equation of the curve such that the particle, after ascending for a time along the curve, will leave it and fall freely till it strikes at T .

NOTES AND NEWS.

Mr. E. B. Smith, instructor in mathematics at Purdue University, has resigned.

Mr. W. M. Persons, of the University of Wisconsin, has been appointed assistant professor of mathematics at Dartmouth College.

Professor J. E. Bonebright, of the Colorado Agricultural College, has been appointed professor of mathematics at Ottawa University, Ottawa, Kansas.

The following officers were elected at the Chicago meeting of the Central Association of Science and Mathematics Teachers: President, O. W. Caldwell, Charleston, Ill.; Treasurer, C. W. D. Parsons, Evanston, Ill.

Dr. S. T. Tamura, B. Sc., M. A. (Iowa), Ph. D. (Columbia), a native of Japan, has been appointed mathematician in the department of terrestrial magnetism of the Carnegie Institution, with which he has been connected as assistant for the past two years.

The Mathematical Section of the California Teachers Association elected the following officers at its recent meeting: President, Professor G. A. Miller; Vice President, Professor W. H. Baker, San Jose Normal School; Secretary, Mr. J. Fred Smith, Campbell High School.